

Group III, covering claims 17-18, drawn to a method of making and using a solid circular tire.

Applicants hereby elect for further prosecution the invention of Group I, covering claims 1-15 and 19, drawn to a method of manufacturing a microcellular polyurethane foam.

IN THE CLAIMS:

Please cancel claim 11.

Please add new claim 20 as follows:

--20. A method of manufacturing a microcellular polyurethane foam comprising the steps of:

selecting an isocyanate-terminated prepolymer containing less than 12% functionality;

preparing a curative component by mixing a polyol, water, a foam surfactant, and a catalyst component comprising a standard solid cast polyurethane catalyst and a delayed-action tin catalyst, wherein the ratio of tin catalyst to standard solid cast polyurethane catalyst component is about 1.25:1 and said water comprises between 1% and 5% of weight of said curative component; and

mixing said curative component with said isocyanate-terminated prepolymer at a functional group (NCO/OH) ratio of about 1:1, provided that if said isocyanate-terminated prepolymer or said curative component is present in excess of one over the other, the maximum percentage of said excess over the other is 2%.

REMARKS

The Office Action of August 14, 2002 has been reviewed and the Examiner's comments carefully considered. Pursuant to a restriction requirement, Applicants have elected Group I. Thus, claims 16-18 have been withdrawn from consideration. The present amendment adds claim 20. Upon entry of the amendment, claims 1-15, and 19-20 will be pending.

Claim 11 stands objected as being dependent upon rejected independent claim 1. Claims 1-10, 12-15 and 19 stand rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 6,395,798 to Younes.

In view of the following remarks, Applicants respectfully traverse the rejections. Applicants thank the Examiner for acknowledging the allowability of claim 11 if rewritten in independent form to include all of the limitations of the base claim and any

intervening claims. Claim 11 has been rewritten as new claim 20 and is deemed allowable. Claim 11 has been canceled.

The Examiner asserts that mixing constituents of a curative component is well known and would have been obvious to one of ordinary skill in the art. The Younes reference discloses mixing the curative component and the prepolymer in an NCO/OH of about 1:1, it does not disclose that any excess of one component over the other be limited to a maximum percentage of 2.0%. Indeed, NCO/OH ratios greater than 1.02 are characterized by a slow build-up of foam integrity, resulting in a product with coarse cell structure and poor dimensional stability. Similar results are also observed at NCO/OH ratios at or below 0.95. Thus, any variance from an NCO/OH 1:1 ratio greater than 2.0% is a critical limitation of the present invention, and Younes neither teaches nor suggests this critical feature.

The Examiner asserts that Younes discloses providing a curative component comprising polyol, catalysts, including delayed action and standard catalyst, water, and surfactant, wherein the water comprises 1.0 –5.0% of the curative. The Younes disclosure of water comprising 1.0-5.0% of the curative component is taken from examples 9-12 and is cited out of context. Examples 9-12 actually disclose water concentrations of 0.7% and 2.7%, which does not suggest the criticality of at least 1.0-5% of water at all. The concentration of water in the present invention is critical to achieve the careful controlled addition of water to the polyol component which then reacts with the isocyanate end groups of the prepolymer. Indeed, water concentrations of between 1.5 to 3.0% of the curative component are the preferred range. In contrast, the Younes patent discloses preparing microcellular elastomers using water concentrations of either 0.7% or 2.7%, depending on whether one wants a lower or higher density elastomer, respectively.

Testimony of the superior properties of the Microcellular (MC) Foam of the present invention compared to prior art solid cast urethane is provided in the Declaration of Brian D. Patten. Scientific analysis was conducted comparing the useful life of wheels fabricated from MC Foam of the present invention and prior art solid cast urethane. Wheel samples were run until visible permanent physical failure of the wheel was evident. After approximately 50-70 million cycles, wheels fabricated from prior art solid cast urethane exhibited fractures in their internal ribs, whereas wheels fabricated from MC Foam lasted for at least 133.3 million cycles, thus having approximately twice the useful life of the prior art solid cast urethane wheels. Thus, the MC Foam wheels of the present invention demonstrated unexpectedly superior properties compared to prior art solid cast urethane wheels.

Further testimony regarding the superior properties of the MC Foam of the present invention compared to prior art solid cast urethane is provided in the Declaration by Ed J. Dziura, a customer and user of the product made in accordance with the present invention. MC Foam Ball Lift tires were compared to prior art Rubber Ball Lift tires on a simulated bowling lane track. After 1.3 million ball elevations, the rubber ball lift tire developed large cracks in its side walls and was virtually destroyed, whereas after 2.8 million ball elevations, the MC Foam Ball Lift tire showed virtually no wear at all. Mr. Dziura attests that no other cast urethane lift tires on the market demonstrate the superior properties of the MC Foam tire of the present invention. Thus, scientific evidence demonstrates that the MC Foam of the present invention possesses unexpectedly superior properties and advantages when compared to prior art solid cast urethane products.

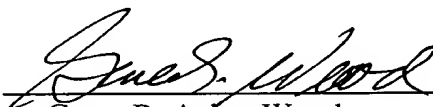
The limitations recited in claim 1, namely, an isocyanate-terminated prepolymer that contains less than 12% functionality, a curative component comprising between 1.0 to 5.0% of water, and an isocyanate-terminated prepolymer NCO/OH ratio that does not vary from 1:1 by more than 2.0%, possesses superior properties compared to prior art solid cast urethane products, that the superior properties give new and unexpected results when they are practiced in combination, and that these new and unexpected results do not occur if any one of the aforementioned parameters are not present. Claims 2-7 depend from claim 1. They too are patentable for at least the same reason claim 1 is patentable.

For all the foregoing reasons, claims 1-10, 12-15 and 19, and new claim 20, are patentable over the cited prior art and in condition for allowance. Reconsideration of the rejections and allowance of all pending claims 1-10, 12-15 and 19-20 are respectfully requested.

Respectfully submitted,

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